

TWO NEW SPECIES OF NEMATODE (NEMATODA: ENOPLIDA: THORACOSTOMOPSIDAE) FROM LAKE ALEXANDRINA, SOUTH AUSTRALIA

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Summary

NICHOLAS, W. L. (1993) Two new species of nematode (Nematoda: Enoplida: Thoracostomopsidae) from Lake Alexandrina, South Australia. *Trans. R. Soc. S. Aust.* 117(4), 163-170, 30 November, 1993.

Two new species of Thoracostomopsidae (Nematoda: Enoplida) are described from Lake Alexandrina near the mouth of the River Murray in South Australia. *Mesacanthion alexandrinus* sp. nov. belongs to the small group of congeners with unequal spicules, but differs in having only slightly unequal spicules and a simple gubernaculum. *Enoploides stewarti* sp. nov. is very similar to another freshwater species, *E. fluviatilis* from the River Volga, but differs in minor details of the spicules and supplementary organ. *Enoploides* and *Mesacanthion* are typically marine genera and implications of the presence of these two new species in freshwater Lake Alexandrina are discussed.

KEY WORDS: Taxonomy, nematodes, distribution, Thoracostomopsidae, River Murray, South Australia, *Mesacanthion alexandrinus* sp. nov., *Enoploides stewarti* sp. nov.

Introduction

The numerous species of the genera *Mesacanthion* and *Enoploides* have worldwide distributions characteristically inhabiting ocean beaches. Several species of both genera have been found in freshwater (Riemann 1975). The two new species described in this paper come from Lake Alexandrina, a large freshwater lake at the mouth of the River Murray, which has only comparatively recently (in 1940) been isolated from the sea by barrages built across the estuary. The nematode fauna of the estuary and of Lake Alexandrina has been described by Nicholas *et al.* (1992), together with observations on hydrology and sedimentology.

Thoracostomopsidae Filipjev, 1927, possess mandibles, one dorsal and two sub-ventral, terminating in recurved hooks that project into the buccal cavity. In *Mesacanthion* Filipjev, 1927, the mandible is formed from two lateral rods joined by an anterior curved bar, enclosing a roughened membrane. In *Enoploides* Ssaweljev, 1912, the lateral bars are fused for most of their length to form a solid rod, without any enclosed membrane, bifurcated anteriorly into curved hooks. In both genera a forwardly directed tooth (onchium), with the opening of the duct of a pharyngeal gland at the tip, lies at the base of each mandible. The cephalic setae are inserted further forward on the cephalic capsule in *Mesacanthion* than in *Enoploides*.

Materials and Methods

The new species were collected during the investigation of the nematode fauna of Lake Alexandrina already referred to (Nicholas *et al.* 1992).

in which 490 ml samples of sandy sediment were taken with a metal corer to a depth of 5 cm at the waters edge. Further details of procedure, sampling and a map locating sampling sites are given in the paper cited. Nematodes were extracted from the sediments by differential sedimentation in tap water, collected on a nylon 75 µm sieve, fixed in 5% formalin, transferred to 5% aqueous glycerol, which was evaporated to anhydrous glycerol at 37°C. After identification under the microscope, permanent mounts were made in anhydrous glycerol.

Mesacanthion alexandrinus sp. nov.

FIGS 1, A-E, 2, A-D, Table 1

Type: Holotype: male, Lake Alexandrina, South Australia, 18.vii.1989, coll. W. L. Nicholas and A. F. Bird, in SAM 23875; paratypes: 2 males and 2 females, Lake Alexandrina, South Australia, 16.vi.1989, 20.viii.1989, coll. W. L. Nicholas and A. F. Bird, in SAM 23876-79; male and female, Lake Alexandrina, South Australia, 18.vii.1989, coll. W. L. Nicholas and A. F. Bird, 18.viii.1989 in W. L. Nicholas collection, slides 1220, 1221.

Description of Holotype male. Cuticle smooth, not annulated, with sparse setae, up to 17 µm long, along the entire body, but fewer and shorter towards the posterior end. Cephalic capsule high, 2.6 times width at base, dome-shaped, with three deeply incised lips, each carrying thin triangular lip-flap. Six 12 µm long labial setae insert at base of lip-flaps. Six 29 µm inner cephalic setae and four adjacent 14 µm outer cephalic setae originate about half-way up cephalic capsule. Three broad mandibles (width 2/3 height), edged by strong lateral and transverse bars, lateral bars terminating in divergent hooks, broad inter-bar membrane externally rough; three onchia at base of

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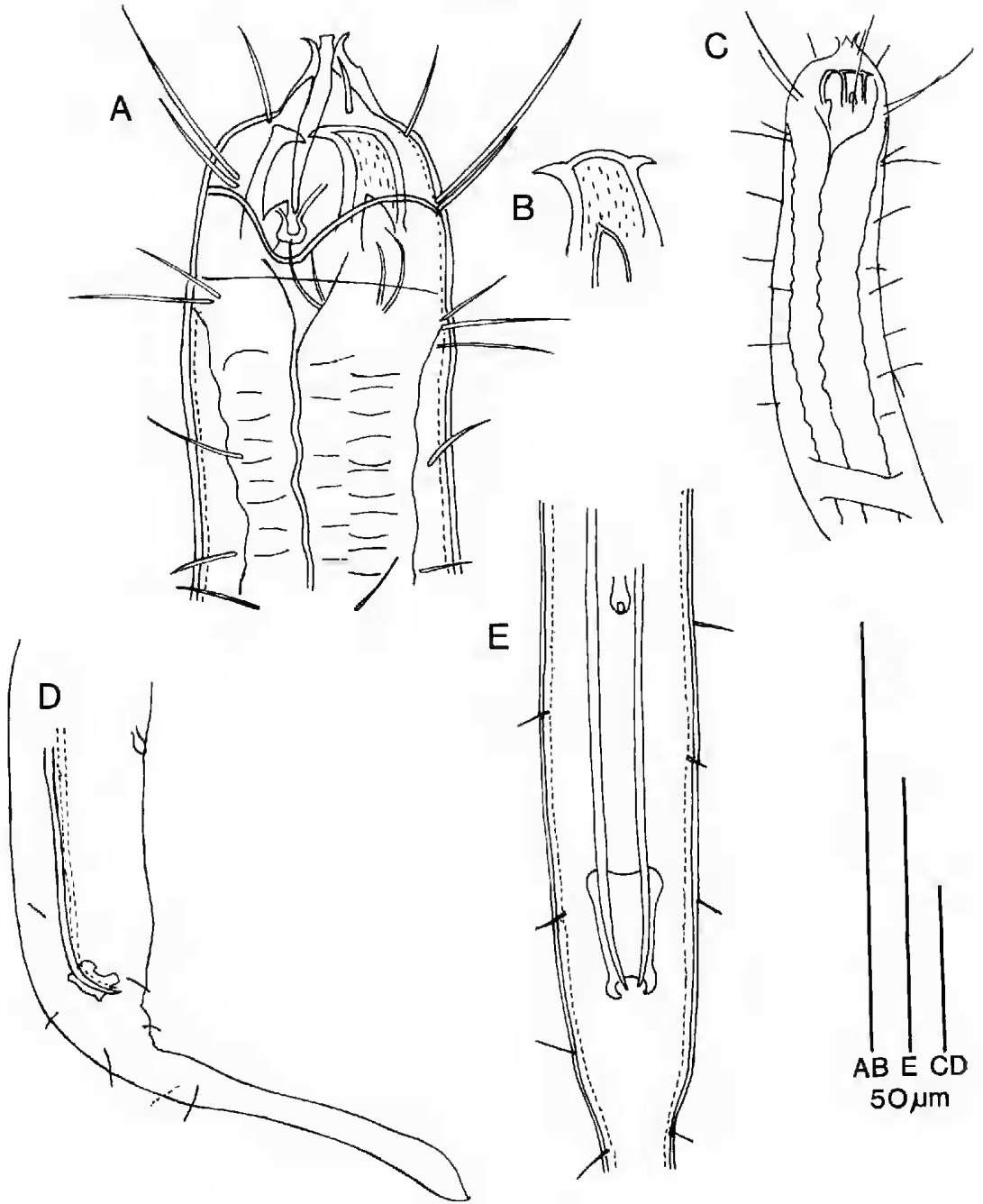


Fig. 1. Male *Mesacanthion alexandrinus* sp. nov. A, head; B, mandible and onchium; C, head and cervical region; D, spicules and supplementary organ in lateral view; E, spicules and supplementary organ in dorsal view.

mandibles. Six pairs of cervical setae inserted immediately posterior to cephalic capsule, each pair with anterior short (10 μm) and posterior long (17 μm) seta. Pharynx long, cylindrical; cardia conical; rectum short, 1.3 times body width at cloaca. Testes, two, opposed, to right of intestine. Two long slightly unequal spicules, with straight shaft curving ventrally towards tip. Gubernaculum flat plate with two terminal hooks, no apophysis; supplementary organ globular, inconspicuous, anterior to and 2.6 body widths from cloaca. Shorter spicule reaches level of supplement (78 μm , 3.1 body widths) longer just beyond it (86 μm , 3.4 body widths). Tail short, narrows sharply behind cloaca then cylindrical almost to tip. Additional dimensions see Table 1.

Paratypes: One male, SAM 23877, displays the spicules in dorsal view (Fig. 1 E) with right spicule longer, and gubernaculum with hooks. Females resemble males, apart from sexual organs, but lack six pairs of cervical setae and, unlike males, tail tapers uniformly to tip. Didelphic opposed gonads. Measurements in Table 1.

Habitat: Freshwater, sand at waters edge of Lake Alexandrina, South Australia.

Comparison with other species: Wieser (1953) published a key to *Mesacanthion* which he later updated (Wieser 1959). The spicules and gubernaculum provide the most useful specific characters, but because

some species had been described only from females it was necessary to find characters applicable to females. The depth and form of the buccal cavity and length of the cephalic setae are also useful. Species described only from juveniles were considered *species inquirendae*. Subsequently, Gerlach & Riemann (1974) listed 40 valid species. Since then four more species have been described: - *M. southerni* Warwick, 1973, *M. arabium* Warwick, 1973, *M. heterospiculum* Sergeeva, 1974, and *M. marisalba* Galtsova, 1976.

M. alexandrinus sp. nov. belongs to the small group with unequal spicules. In *M. diplochma* (Southern, 1914), redescribed by Boucher (1977) and *M. southerni*, the spicules are very unequal, whereas in *M. alexandrinus* sp. nov. they are both long and only slightly unequal. The gubernaculum in *M. arabium* is like that of *M. alexandrinus*, sp. nov. but the former is much larger, has equal spicules, and possesses two rows of stout pre-cloacal setae. *M. longispiculum* Gerlach, 1954 resembles the new species, but has much longer and equal spicules. In *M. heterospiculum* the spicules are uniformly curved, the tail is conical and uniformly tapered, the cuticle annulated.

In comparison with species described only from females, all included in Wieser (1959), *M. alexandrinus* sp. nov. belongs to the group in which the buccal cavity is deep, conical, without basal pockets. It can be distinguished from all the others, either because it has very short labial setae or possesses very long cephalic setae, or has setae arising close to the base of the cephalic capsule.

TABLE 1. *Measurements of Mesacanthion alexandrinus*, sp. nov.

Type	holo	para	para	para	para	para	para
Sex	Male	Male	Male	Male	Female	Female	Female
Slide	23875	23876	23877	1220	23878	23879	1221
Length	1630	1780	1450	2460	2560	2270	2570
Max. width	38	54	37	59	66	86	60
Labial setae	12	13	12	12	12	9	12
Inner cephalic	29	27	28	29	27	27	28
Outer cephalic	14	13	12	16	11	16	19
Mandible h x w	9 x 14	8 x 10	8 x 10	12 x 14	8 x 13	12 x 14	14 x 15
Head, h x w	22 x 33	22 x 33	20 x 27	28 x 36	26 x 38	15 x 20	21 x 33
Nerve ring	126	141	114	153	151	180	160
Pharynx	526	504	430	575	730	594	718
Vulva	-	-	-	-	1600	1242	1406
Tail	108	131	97	110	139	137	136
Width at anus	25	29	23	32	33	32	36
Spicules, arc	78; 86	70; 79	72; 82	69; 80	-	-	-
Supplement	66	70	64	69	-	-	-
Tail/anal breadth	4.32	4.52	4.22	3.44	4.21	4.28	3.44
Nerve ring/pharynx	0.24	0.28	0.27	0.26	0.21	0.30	0.22
l. cephalic setae/hw	0.42	0.39	0.44	0.40	0.31	0.42	0.50
Mandible h/w	0.64	0.80	0.80	0.85	0.62	0.85	-
Spicule/anal width	3.12; 3.44	2.41; 2.72	3.13; 3.56	2.15; 2.5	-	-	-
De Man's ratio a	43	33	39	42	39	26	42
" b	3.1	3.5	3.4	3.6	3.5	3.8	3.6
" c	15	14	15	22	18	17	19
" c'	4.3	4.5	4.2	3.4	4.2	4.3	3.8
" V%	-	-	-	-	63	55	55

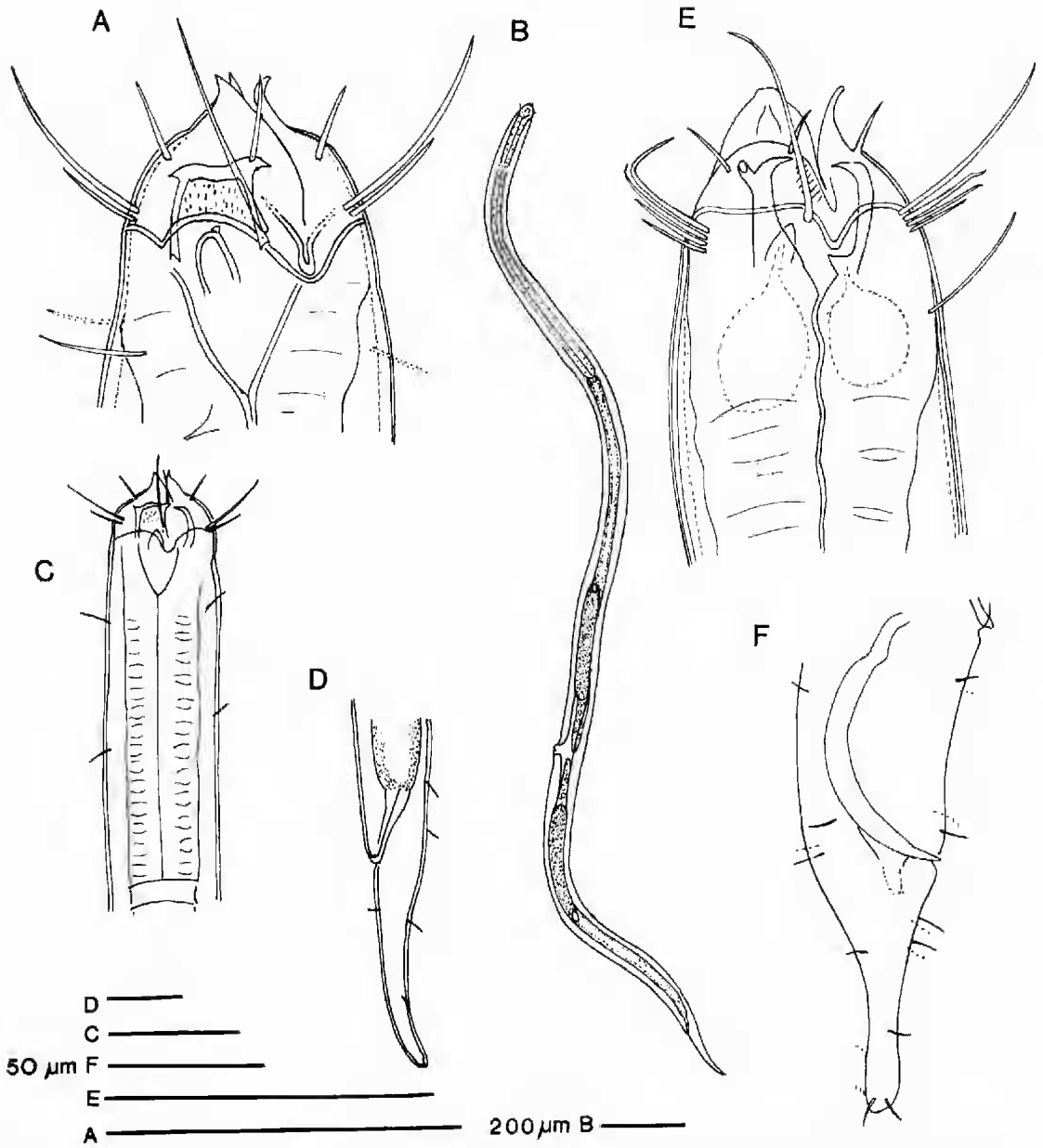


Fig. 2. *Mesacanthion alexandrinus* sp. nov. A, female head; B, entire female; C, head and cervical region; D, female tail. *Enoploides stewarti* sp. nov. E, male head; F, tail and spicules.

Enoploides stewarti sp. nov.

FIGS 2, E, F, 3 A-E, Table 2

Types: Holotype: male, Lake Alexandrina, South Australia, 13.xii.1988, coll. W. L. Nicholas and A. F. Bird, in SAM 23880; paratypes: 2 males and 2 females, Lake Alexandrina, South Australia, 18.vii.1989, 5.x.1988, in SAM 23881-83; male and female, same location and collectors, 5.x.1988, W. L. Nicholas collection slide 1218.

Description of Holotype male. Body relatively plump, cuticle without annulation, scattered short setae along body. Cephalic capsule short, broad, height 0.38 times width at cephalic setae, three lips with deeply incised margins with striated borders, lips surmounted by thin flexible lip-flaps. Six labial setae (11 μ m) at base of flaps, six long inner cephalic setae (31 μ m) and four shorter outer cephalic setae (12 μ m) inserted at base of cephalic capsule. Three mandibles characteristic of genus, lateral bars fused to form single rod, terminating in divergent hooks; three onchia at base of mandibles. Pharynx relatively long, muscular, cylindrical, terminating in conical cardia enclosed by anterior intestine. Two opposed testes, to right of intestine. Spicules uniformly curved, cyathiform, with proximal cylindrical knob. Supplementary organ inconspicuous, globular, 2.4 times body width at cloaca; gubernaculum a simple plate with very weak apophysis, caudal glands well developed, tail very short, conical, with swollen tip bearing three setae. Additional measurements in Table 2.

Paratypes: In males tail length is rather variable, as is distance of supplementary organ from cloaca. Females resemble males apart from sexual organs. Didelphic ovaries opposed, antidromous, to right of intestine, each uterus with one large egg. See Table 2 for measurements.

Habitat: Freshwater, sand at waters edge of Lake Alexandrina, South Australia.

Comparison with other species: The genus *Enoploides* can be divided into two groups. One, comprising most of the 42 described species, possesses relatively long spicules, of the order of 300 μ m, and a strong gubernaculum, the shape of which is of taxonomic value (Wieser & Hopper 1967). The other with relatively short spicules and a weak or rudimentary gubernaculum includes: *E. cirrhatu*s Filipjev, 1918; *E. fluviatilis* Micoletzky, 1923; *E. caspersi* Riemann, 1966; *E. disparilis* Sergeeva, 1974; *E. alexandrae* Uzunov, 1974; *E. polysetosus* Jensen, 1986 and *E. stewarti* sp. nov.

E. caspersi can readily be distinguished from *E. stewarti* sp. nov. and others of this group by possessing a prominent post-anal organ. In *E. polysetosus* the spicules are longer (162-174 μ m), thinner and almost straight, and the body carries many very fine somatic setae. Taxonomic differences between the other four species are given in Table 3.

The two freshwater species of *Enoploides*, *E. fluviatilis* and *E. stewarti* sp. nov. are very similar, though from widely separated localities, namely the

TABLE 2. Measurements of *Enoploides stewarti* sp. nov.

Type	holo	para	para	para	para	para
Slide	1160	1161	1218	1166	1165	1218
Sex	Male	Male	Male	Female	Female	Female
Length	3080	1930	2115	2750	2578	2510
Max. width	63	70	59	120	105	85
Labial setae	11	15	8	12	9	10
Inner cephalic	31	30	27	37	30	37
Outer cephalic	14	17	15	17	19	19
Mandible h x w	9 x 6	10 x 8	12 x 9	14 x 10	13 x 9	14 x 11
Head, h x w	11 x 35	10 x 35		14 x 49	11 x 44	16 x 42
Nerve ring	151	134	140	162	160	140
Pharynx	632	491	458	572	621	581
Vulva	-	-	-	1504	1458	1406
Tail	134	93	89	134	139	145
Width at anus	50	52	42	53	47	52
Spicules, arc	121	107	108	-	-	-
Supplement	118	78	100	-	-	-
Tail/anal breadth	2.68	1.79	2.12	2.53	2.96	2.79
Nerve ring/pharynx	0.24	0.27	0.31	0.28	0.25	0.24
l. ceph. setae/hw	1.07	0.86	0.79	0.75	0.61	0.88
Mandible h/w	0.67	0.75	0.79	0.75	0.69	0.79
Spicule/anal width	2.42	2.06	2.57	-	-	-
De Man's ratio a	49	28	36	23	25	30
" b	4.9	3.9	4.6	4.8	4.2	4.3
" c	23	21	24	21	19	17
" c'	2.7	1.8	2.1	2.5	3.0	2.8
" V%	-	-	-	56	56	56

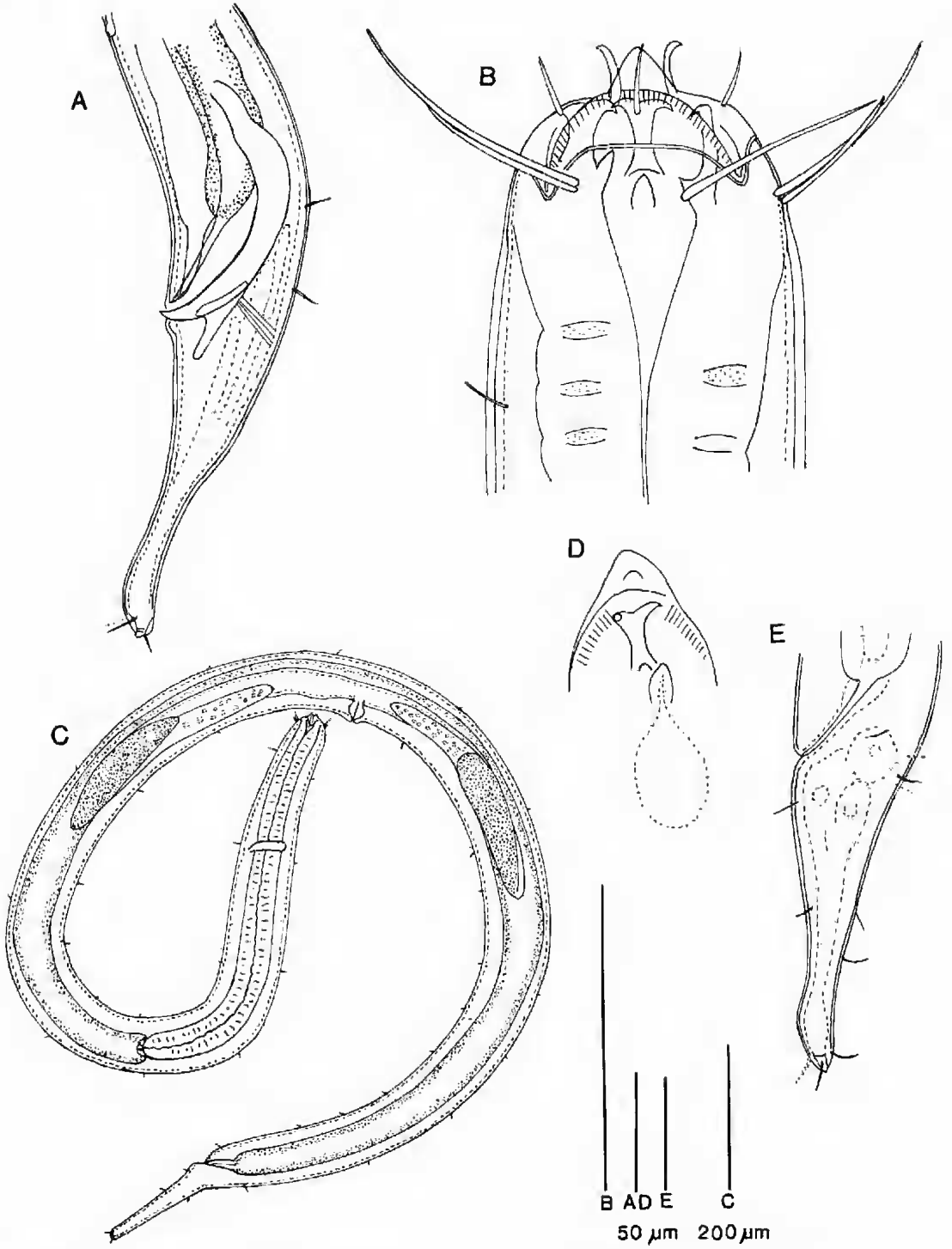


Fig. 3. *Enoploides stewarti* sp. nov. A, male tail; B, female head; C, entire female; D, mandible and onchium; E, female tail.

River Volga in Russia and the River Murray in Australia. In addition to Micoletzky's very full description, comparison between the two species has been facilitated by the loan of a male and female of *E. fluviatilis* from Russia by Dr Tsalolikhin. Both have shorter tails and longer spicules than others in this group, but because the males of *E. stewarti* show such significant differences in tail and spicule length, these characters cannot be used to separate the two species. The distance of the supplement from the cloaca also is too variable (118, 100 and 78 compared with 75 μm). However, the spicules of *E. fluviatilis* are transversely striated, terminal tail setae are lacking and there are two minute post-anal tail papillae, all differences from *E. stewarti* sp. nov.

Key to the males of *Enoploides* with short spicules, less than 300 μm

1. Spicules >150 μm , body hirsute, no post-anal organ *E. polysetosus*
Spicules <150 μm , not hirsute 2
2. Male with prominent post-anal organ *E. caspersi*
Male without such organ 3
3. Tail long ($c < 10$, $c' = 7$), no post-anal setae *E. disparilis*
Tail long ($c > 10$, $c' = 5$) with pre- or post-anal setae or papillae 4
4. Tail medium $c = 10-16$, $c' < 5$ 5
Tail very short, $c > 16$, $c' < 5$ 6
5. 7-8 pairs post-anal setae *E. alexandrae*
7 pairs pre-anal papillae *E. cirrhatus*
6. Tail with two post-anal papillae, no terminal setae *E. fluviatilis*

Tail with 3 terminal setae, no post-anal papillae
..... *E. stewarti* sp. nov.

Discussion

Lake Alexandrina has been isolated from saline estuarine water for only 50 years, since the building of the barrages across the estuary of the River Murray. Possibly both species, have become adapted to freshwater in the very short time since they were trapped above the barrages. However, no similar species were found below the barrages (Nicholas *et al.* 1992), nor have they been found in extensive collecting on nearby ocean beaches subsequently. Before the building of the barrages the outflow from the Murray was subject to great variations, and in droughts the flow of river water out of the estuary sometimes failed allowing sea water into the lake system. At times in the past when the climate was drier, these conditions may have persisted long enough for the adaptation of marine species to tolerate wide variations in salinity and eventually freshwater. It is not known whether any Thoracostomopsidae occur elsewhere in the Murray Darling system.

It is interesting that *E. stewarti* sp. nov. very closely resembles *E. fluviatilis*, from the River Volga in Russia, and is closer to *E. alexandrae* and *E. disparilis* from the Black Sea than congeners. Perhaps it was carried to South Australia on the bottom of ships, although the Murray mouth was not a useful port because of its treacherous and unreliable entrance. In this context it is interesting to note that specimens of *Oncholaimus thajardinii* described from Plymouth in the British Isles,

TABLE 3. Features separating *Enoploides stewarti* sp. nov. and four similar species.

	<i>E. cirrhatus</i>	<i>E. alexandrae</i>	<i>E. disparilis</i>	<i>E. fluviatilis</i>	<i>E. stewarti</i>
Cuticle	annulated	annulated	annulated	smooth	smooth
Spicule, arc	60	48/50	35	112	107-121
Spicule head	rounded	rounded	?	cylindrical	cylindrical
c	16	12	9.8	25	2.1-3.0/1.7-2.1
c'	?	5*	7.2*	3*	1.8-2.7/2.5-3.0

* Calculated from figures

TABLE 4. Comparison between measurements of *Enoploides fluviatilis* and *E. stewarti* sp. nov.

	Body	Tail	Spicules, arc	Supplement to cloaca
<i>E. fluviatilis</i>				
type	1610	60	112*	75*
range	1340-1900	54-61		
Male on loan	2219	67	91	60
<i>E. stewarti</i> sp. nov.				
holotype	3080	134	121	118
2 paratype males	1930-2115	89-93	107-108	78-100
3 paratype females	2587-2749	134-145		

* Calculated from figures.

together with several other nematode genera, have been identified in scrapings from the bottom of sailing ships entering the port of Sydney from the British Isles (for Bicentenary celebrations) as part of an unpublished study by the Australian Museum. Studies of the as yet unexplored nematode fauna of Australian inland waters may throw fresh light on the natural history of the two new species.

Acknowledgments

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